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| 09/775,835      | 01/31/2001  | Woo Sik Yoo          | M-8250 US           | 1153             |

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EXAMINER

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| ART UNIT | PAPER NUMBER |
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2829

DATE MAILED: 11/06/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/775,835

Applicant(s)

YOO, WOO SIK

Examiner

Lisa A Kilday

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on amendment filed on 7/12/02.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

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***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-10 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. On page 3 lines 13-18, the specification is silent on the "internal environment" of a process chamber. The specification does not disclose a first molecular ratio, a molecular content and adjusting the first molecular ratio to a second. The specification also does not disclose removing the wafer while the chamber is at the processing temperature. Art has not been applied to the limitations rejected under 35 U.S.C. 112, first paragraph. Therefore, to apply art, examiner assumes that the wafer is at the processing temperature. See pg. 7, specification. The specification does not support a first molecular ratio to a second molecular ratio. Although molecular ratios are inherent to processing with gases, the specification does not disclose a first molecular ratio, a second molecular ratio, or adjusting first molecular ratio to second molecular ratio.

Claims 1-10 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. See explanation in the paragraph above.

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The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "pulling" in claim 14 is a relative term which renders the claim indefinite. The term "pulling" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Replace the term pulling with either "establishing" or "decreasing" or "in an ambient pressure" or "in a reduced pressure". It is unclear to whether "pulling a first pressure" is in a vacuum or in ambient pressure.

In claims 1, 11, 14, it is unclear whether the processing temperature is that of the furnace or that of the wafer. In the former case, claims 1, 11, 14 omit essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: keeping the temperature of furnace at steady-state processing temperature while removing the wafer from the chamber. It is unclear whether the furnace remains at the steady-state processing temperature or if the wafer remains at that temperature. To apply art, examiner assumes the temperature to be that of the wafer.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-21 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Wolf and Tauber, Silicon Processing for the VLSI Era, vol. 1-Process Technology: pp. 164-165, 169-178, 182-4, 194, and Wolf, vol. 2-Process Integration: pp. 331, 431, 434-5.

The processes taught by the applicant are known as LPCVD, SACVD, PECVD, and APCVD. Wolf and Tauber disclose the processing temperature (pg. 194), pressure (pg. 169), reactive (pp. 182-4,194) and inert gases (pg. 164).

In re claims 1 & 14 (and 17, 19-21), Wolf and Tauber discloses a method for forming a thin film on a semiconductor wafer comprising: heating a process chamber to a steady-state processing temperature; loading a semiconductor wafer (pg. 174 ¶ 4, pg. 172 lines 25-26) into said process chamber; introducing a reactive gas into said process chamber at a preselected pressure (pg. 165); and unloading the semiconductor wafer from said process chamber at said processing temperature (pg. 164 ¶ 1, fig 2, pg. 174 ¶ 4, pg. 175 ¶ 2, pg. 194 table 4; Wolf: vol. 2: pg. 331 § 5.4.1.3, pg. 431 lines 1-5, pg. 434 § 6.6.2.4).

In re claim 2 with limitations of claim 1 (and 15 with limitations of 14), Wolf and Tauber disclose that the temperature is between 800-1200°C (pg. 170 lines 23-24, pg. 183 table 2 & lines 19-24, pg. 194 table 4).

In re claim 3 with limitations of claim 1, Wolf and Tauber disclose that the temperature is 200-800°C (pg. 169 3<sup>rd</sup> ¶, pg. 170 lines 23-25, pg. 183 table 2 & lines 19-24, pg. 194 table 4).

In re claim 4 with limitations of claim 1, Wolf and Tauber discloses that introducing said reactive gas includes introducing an inert gas, wherein said molecular ratio between said reactive gas and said inert gas causes said reactive gas to be at said preselected pressure (pg. 182 lines 30-36, pg. 183 table 2 & lines 19-24, pg. 194 table 4).

In re claim 5 with limitations of claims 4 and 1 (in re claim 15 with limitations of claim 14), Wolf and Tauber disclose that the pressure of the reactive gas is 0.1-760 Torr (pg. 170 lines 2-3, pg. 173 line 15, pg. 178 lines 1-20 & fig. 12).

In re claim 6 with limitations of claims 4 and 1, Wolf and Tauber discloses that the inert gases consist of Ar, He, and N<sub>2</sub> (pg. 164 lines 5-10, pg. 194 table 4, eqn. 10, & lines 1-21).

In re claim 7 with limitations of claim 1, Wolf and Tauber discloses that the pressure of reactive gas is 0.1-760 Torr (pg. 165 lines 9-11, pg. 169 lines 23-25, pg. 170 lines 1-3, pg. 173 lines 14-16, pg. 183 lines 19-20, pg. 184 lines 39-41, pg. 194 lines 1-5).

In re claim 8 with the limitations of claim 1, Wolf and Tauber disclose that the partial pressure of said process chamber is 0.1-760 Torr (pg. 165 lines 9-11, pg. 169 lines 23-25, pg. 170 lines 1-3, pg. 173 lines 14-16).

In re claim 9 with limitations of claim 1 (in re claim 18 with limitations of claim 14), Wolf and Tauber disclose that the reactive gas consists of O<sub>2</sub>, NH<sub>3</sub>, TaETO, NO, N<sub>2</sub>O, and H<sub>2</sub>O (pg. 183 table 2 & lines 17-32, pg. 184 lines 1-44, pg. 194 table 4 & lines 1-21; Wolf - vol. 2: pg. 434 § 6.6.2.4 - pg. 435 lines 1-19).

In re claim 10 with the limitations of claim 1, Wolf and Tauber disclose diluting said reactive gas with N<sub>2</sub> to reduce the pressure (pg. 164 lines 8-9).

In re claim 11, Wolf and Tauber discloses a method for forming a thin film on a wafer by heating a process chamber to a steady-state processing temperature; loading a semiconductor wafer into a chamber, said process chamber being under vacuum pressure; introducing a process gas under a pressure into said process chamber; and removing said semiconductor wafer from said process chamber while said process chamber is under vacuum pressure (pg. 164 ¶ 1, fig 2, pg. 174 ¶ 4, pg. 175 ¶ 2, pg. 194 table 4).

In re claim 12 and 13, it has been held that to be entitled to weight in method claims, the recited structure limitations therein must affect the method in a manipulative sense, and not amount to the mere claiming of a use of a particular structure. *Ex parte Pfeiffer*, 1962, C.D. 408 (1961).

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-21 have been considered but are moot in view of the new ground(s) of rejection. Applicant's arguments are moot in view of new grounds drawn towards newly added limitations. Wolf and Tauber discloses heating a process chamber to a steady-state processing temperature; loading a wafer

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into said process chamber (pg. 174 ¶4, pg. 172 lines 25-26); introducing a reactive gas into said chamber (pg. 165); unloading the wafer from said chamber at said steady-state temperature (pg. 164 ¶1, fig. 2, pg. 174 ¶4, pg. 175 ¶2, pg. 194 table 4; Wolf – vol. 2: pg. 331 §5.4.1.3, pg. 431 lines 1-5, pg. 434 §6.6.2.4). Wolf discloses on pg. 165 lines 5-7, introducing a reactive gas into said process chamber at a preselected pressure. Wolf and Tauber disclose unloading the semiconductor wafer from said process chamber at said processing temperature (pg. 164 ¶1, fig. 2, pg. 174 ¶4, pg. 175 ¶2, pg. 194 table 4; Wolf - vol. 2: pg. 331 § 5.4.1.3, pg. 431, lines 1-5, pg. 434 §6.6.2.4). Wolf and Tauber disclose that the temperature is between 200-1200°C (pg. 183 table 2, pg. 194 table 4).

Wolf and Tauber disclose that the pressure of the reactive gas is .1-760 Torr (pg. 170 lines 2-3, pg. 178 fig. 12).

Wolf and Tauber disclose said inert gases (pg. 164 lines 5-10, pg. 194 table 4). Such usage of inert gases Ar, He, N<sub>2</sub> are well known.

Wolf and Tauber disclose that the reactive gas consists of O<sub>2</sub>, NH<sub>3</sub>, TaETO, NO, N<sub>2</sub>O, and H<sub>2</sub>O (pg. 183 table 2, pg. 194 table 4; Wolf-vol. 2: pg. 434-435). It is well known in the art to use O<sub>2</sub>, NH<sub>3</sub>, TaETO, NO, N<sub>2</sub>O, and H<sub>2</sub>O in semiconductor processing methods. A source of oxygen is necessary for oxidation.

Using a dilution gas to reduce the pressure of said reactive gas is also well known in the art. Wolf and Tauber disclose on pg. 164 lines 8-9 such dilution.

Wolf and Tauber disclose forming a thin film on a wafer (pg. 164 ¶1, fig. 2, pg. 174 ¶4, pg. 194 table 4).

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It has been held that to be entitled to weight in method claims, the recited structure limitations therein must affect the method in a manipulative sense, and not amount to the mere claiming of a use of a particular structure. *Ex parte Pfeiffer*, 1962, C.D. 408 (1961). The applicant has not shown how the removal of the wafers by a robot arm affects the method of forming a thin film on a wafer.

Applicant asserts that in most processing applications, the processing temperature is reduced from processing temperature in order to stop the processing reactions from occurring. It is inherent that Wolf and Tauber disclose unloading the semiconductor wafer from said process chamber at said processing temperature because the wafer is removed and cooled to prevent thermal shock, delamination, and cracking. If applicant means that removal of the wafer where the chamber is at the processing temperature, then the applicant does not have support for this limitation.

### **Conclusion**


Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0957. See MPEP 203.08.

Any inquiry concerning this communication from the examiner should be directed to Lisa Kilday whose telephone number is (703) 306-5728. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo, can be reached on (703) 308-1233. The fax number for the group is (703) 305-3432. MPEP 502.01 contains instructions regarding procedures used in submitting responses by facsimile transmission.

Lisa Kilday

LAK

11/4/02



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